Naval Education and Training Command

NAVEDTRA 82853
September 1995
0503-LP-480-9400

Nonresident Training Course (NRTC)

Aerographer's Mate 1 & C

Only one answer sheet is included in the NRTC. Reproduce the required number of sheets you need or get answer sheets from your ESO or designated officer.

0503LP4809400

Although the words “he,” “him,” and “his” are used sparingly in this manual to enhance communication, they are not intended to be gender driven nor to affront or discriminate against anyone reading this material.

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

The public may request copies of this document by writing to Superintendent of Documents, Government Printing Office, Washington, DC 20402-0001 or to the Naval Inventory Control Point (NICP) - Cog “I” Material, Attention Cash Sales, 700 Robbins Avenue, Philadelphia PA 19111-5098.

AEROGRAPHER'S MATE 1 & C

NAVEDTRA 82853

Prepared by the Naval Education and Training Program Management Support Activity, Pensacola, Florida

Congratulations! By enrolling in this course, you have demonstrated a desire to improve yourself and the Navy. Remember, however, this self-study course is only one part of the total Navy training program. Practical experience, schools, selected reading, and your desire to succeed are also necessary to successfully round out a fully meaningful training program. You have taken an important step in self-improvement. Keep up the good work.

HOW TO COMPLETE THIS COURSE SUCCESSFULLY

ERRATA: If an errata comes with this course, make all indicated changes or corrections before you start any assignment. Do not change or correct the Training Manual (TRAMAN) or assignments in any other way.

TEXTBOOK ASSIGNMENTS: The TWRAMAN for this course is Aerographer's Mate 1 & C, NAVEDTRA 12853. The TRAMAN pages that you are to study are listed at the beginning of each assignment. Study these pages carefully before attempting to answer the questions in the course. Pay close attention to tables and illustrations because they contain information that will help you understand the text. Read the learning objectives provided at the beginning of each chapter or topic in the text and/or preceding each set of questions in the course. Learning objectives state what you should be able to do after studying the material. Answering the questions correctly helps you accomplish the objectives.

BLACK DOT INFORMATION: Black dots (●) may be used in the text and correspondence course to emphasize important or supplemental information and to highlight instructions for answering certain questions. Read these black dot entries carefully; they will help you answer the questions and understand the material.

SELECTING YOUR ANSWERS: After studying the TRAMAN, you should be ready to answer the questions in the assignment. Read each question carefully, then select the BEST answer. Be sure to select your answer from the subject matter in the TRAMAN. You may refer freely to the TRAMAN and seek advice and information from others on problems that may arise in the course. However, the answers must be the result of your own work and decisions. You are prohibited from referring to or copying the answers of others and from giving answers to anyone else taking the same course. Failure to follow these rules can result in suspension from the course and disciplinary action.

SUBMITTING COMPLETED ANSWER SHEETS: Complete all assignments as quickly as possible to derive maximum benefit from the course. As a minimum, you must submit at least one assignment per month. This is a requirement established by the Chief of Naval Education and Training. Failure to meet this requirement could result in disenrollment from the course.

TYPES OF ANSWER SHEETS: If you are a U.S. Navy enlisted member on active duty or a drilling U.S. Naval Reserve enlisted member, you should use the answer sheet attached at the end of this course and follow the instructions in section A below. If you are an enlisted U.S. Naval Reserve member who is not attached to a drilling unit or if you are an officer, a civilian, or a member of the U.S. Army, Air Force, Marine Corps, or Coast Guard, you should use the Automatic Data Processing (ADP) answer sheets included in the course package and follow the instructions in section B.

A. Manually Scored Answer Sheets

If you are a U.S. Navy enlisted member on active duty or attached to a U.S. Naval Reserve drilling unit, your course will be administered by your local command. You must use the answer sheet designed for manual scoring, NETPMSA form 1430/5, Stock Ordering Number 0502-LP-216-0100. You may get a supply of the forms from your Educational Services Officer (ESO), or you may reproduce the one in the back of this course booklet. DO NOT USE THIS FORM FOR COURSES ADMINISTERED BY NETPMSA.

Recording Information on the Manually Scored Answer Sheets: As you complete each assignment, submit the completed answer sheet to your ESO for grading. You may submit more than one answer sheet at a time. Remember, you must submit at least one assignment each month.

Grading: Your ESO will grade each answer sheet and notify you of any incorrect answers. The passing score for each assignment is 3.2. If you receive less than 3.2 on any assignment, the ESO will list the questions you answered incorrectly and give you an answer sheet marked "RESUBMIT." You must redo the assignment and complete the RESUBMIT answer sheet. The maximum score you can receive for a resubmitted assignment is 3.2.

Course Completion: After you have submitted all the answer sheets and have earned at least 3.2 on each assignment, your command should give you credit for this course by making the appropriate entry in your service record.

Student Questions: If you have questions concerning the administration of this course, consult your ESO.

B. ADP Answer Sheets

If you are an enlisted U.S. Naval Reserve member who is not attached to a drilling reserve unit or if you are an officer, a civilian, or a member of the U.S. Army, Air Force, Marine Corps, or Coast Guard, use the ADP answer sheets provided in your course package. You should use one blank original ADP answer sheet for each assignment. Use only the original ADP answer sheet provided in your course package; NETPMSA will not accept reproductions.

Recording Information on the ADP Answer Sheets: Follow the "MARKING INSTRUCTIONS" on each answer sheet. Be sure that blocks 1, 2, and 3 are filled in correctly. This information is necessary for your course to be properly processed and for you to receive credit for your work.

As you work the course, be sure to mark your answers in the course booklet because your answer sheets will not be returned to you. When you have completed an assignment, transfer your answer from the course booklet to the answer sheet.

Mailing the Completed ADP Answer Sheets: Upon completing an assignment, mail the completed answer sheet to:

COMMANDING OFFICER
NETPMSA CODE 074
6490 SAUFLEY FIELD RD
PENSACOLA FL 32559-5000

Use envelopes to mail your answer sheets. You must provide your own envelopes or request them from your ESO. You may enclose more than one answer sheet in a single envelope. Remember, regardless of how many answer sheets you submit at a time, NETPMSA should receive at least one assignment a month.

NOTE: DO NOT USE THE COURSE COMMENTS PAGE AS AN ENVELOPE FOR RETURNING ANSWER SHEETS OR OTHER COURSE MATERIALS.

Grading: NETPMSA will grade the answer sheets and notify you by letter concerning your grade for each assignment, your incorrect answers, and your final grade. The passing score for each assignment is 3.2. If you receive less than 3.2 on any assignment, you must rework the assignment. NETPMSA will enclose a new ADP answer sheet in the letter notifying you of the questions you answered incorrectly. You will be required to redo the assignment and resubmit the new answer sheet. The maximum score you can receive for a resubmitted assignment is 3.2.

Course Completion: When you complete the last assignment, fill out the "Course Completion" form in the back of the course and enclose it with your last answer sheet. NETPMSA will issue you a letter certifying that you satisfactorily completed the course. You should make sure that credit for the course is recorded in your service record. YOU MAY RETAIN THE TEXT.

NOTE: YOUR OFFICIAL COURSE COMPLETION DATE WILL BE THE DATE YOUR LAST ASSIGNMENT IS PROCESSED THROUGH THE NETPMSA ADP SYSTEM--NOT THE DATE You DEPOSIT THE LAST ASSIGNMENT IN THE MAIL. This is especially important if you are taking the course for Naval Reserve retirement credit. You must mail your answer sheets at least 60 days before your anniversary date. This will provide you with enough time for delays in the mail or reworking failed assignments. DO NOT MAIL YOUR ASSIGNMENTS TO THE NAVAL RESERVE PERSONNEL COMMAND (NRPC).

Student Questions: Refer questions concerning this course to NETPMSA by mail (use the address on page ii) or by telephone: DSN 922-1366 or commercial (904) 452-1366.

NAVAL RESERVE RETIREMENT CREDIT

If you are a member of the Naval Reserve, you will receive retirement points if you are authorized to receive them under current directives governing retirement of Naval Reserve personnel. For the purpose of Naval Reserve retirement, this edition of the course is evaluated at 8 points. These points will be credited to you upon your satisfactory completion of the entire course.

NOTE: YOUR OFFICIAL COURSE COMPLETION DATE WILL BE THE DATE YOUR LAST ASSIGNMENT IS PROCESSED THROUGH THE NETPMSA ADP SYSTEM--NOT THE DATE YOU DEPOSIT THE LAST ASSIGNMENT IN THE MAIL. Refer to the Course completion paragraph under section B. ADP Answer Sheets.

COURSE OBJECTIVES

The objective of this course is to provide Aerographer's Mates with occupational information on the following areas: convergence, divergence, and vorticity; the forecasting of upper air systems; the forecasting of surface systems; the forecasting of weather elements; the forecasting of severe weather features; sea

surface forecasting; meteorological products and tactical decision aids; oceanographic products and tactical decision aids; operational oceanography; tropical forecasting; weather radar; meteorological and oceanographic briefs; and administration and training.

Naval courses may include several types of questions--multiple-choice, true-false, matching, etc. The questions are not grouped by type but by subject matter. They are presented in the same general sequence as the textbook material upon which they are based. This presentation is designed to preserve continuity of thought, permitting step-by-step development of ideas. Not all courses use all of the types of questions available. The student can readily identify the type of each question, and the action required, by inspection of the samples given below.

MULTIPLE-CHOICE QUESTIONS

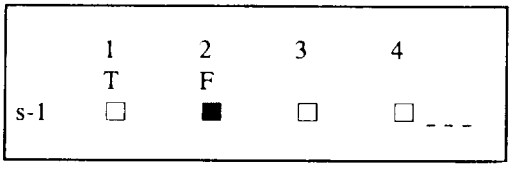
Each question contains several alternatives, one of which provides the best answer to the question. Select the best alternative, and blacken the appropriate box on the answer sheet.

SAMPLE

s-1. Who was the first person appointed Secretary of Defense under the National Security Act of 1947?

1. George Marshall
2. James Forrestal
3. Chester Nimitz
4. William Halsey

Indicate in this way on the answer sheet:



TRUE-FALSE QUESTIONS

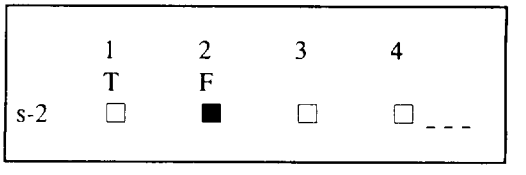
Mark each statement true or false as indicated below. If any part of the statement is false the statement is to be considered false. Make the decision, and blacken the appropriate box on the answer sheet.

SAMPLE

s-2. All naval officers are authorized to correspond officially with any systems command of the Department of the Navy without their respective commanding officer's endorsement.

1. True
2. False

Indicate in this way on the answer sheet:



MATCHING QUESTIONS

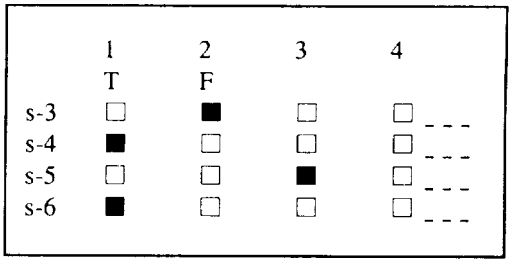
Each set of questions consists of two columns, each listing words, phrases or sentences. The task is to select the item in column B which is the best match for the item in column A that is being considered. Items in column B may be used once, more than once, or not at all. Specific instructions are given with each set of questions. Select the numbers identifying the answers and blacken the appropriate boxes on the answer sheet.

SAMPLE

In questions s-3 through s-6, match the name of the shipboard officer in column A by selecting from column B the name of the department in which the officer functions. Some responses may be used once, more than once, or not at all.

A. OFFICER	B. DEPARTMENT
s-3. Damage Control Assistant	1. Operations Department
s-4. CIC Officer	2. Engineering Department
s-5. Disbursing Officer	3. Supply Department
s-6. Communications Officer	

Indicate in this way on the answer sheet:



ASSIGNMENT 1

Textbook Assignment: "Convergence, Divergence, and Vorticity," "Forecasting Upper Air Systems," and "Forecasting Surface Systems." Pages 1-1 through 3-10.

1-1. Maximum convergence and divergence occurs between what levels aloft?

1. 850- to 700-hPa levels
2. 700- to 500-hPa levels
3. 500- to 300-hPa levels
4. 300- to 200-hPa levels

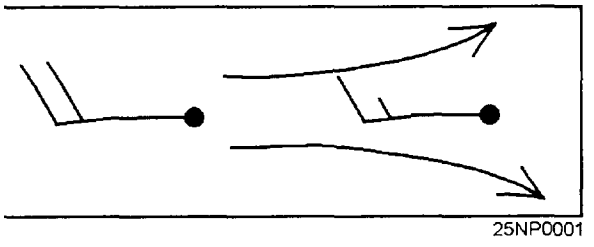


Figure 1-A

IN ANSWERING QUESTION 1-2, REFER TO FIGURE 1-A.

1-2. The wind symbols and streamlines in Figure 1-A depict what information?

1. Speed divergence and directional divergence
2. Speed convergence and directional divergence
3. Speed divergence and directional convergence
4. Speed convergence and directional convergence

1-3. The "advection" stratum may be regarded as the stratum below what specific level?

1. The 200-hPa level
2. The 300-hPa level
3. The 400-hPa level
4. The 500-hPa level

1-4. If all other motions of convergence and divergence are neglected, rising and falling heights at the isopycnic level are the result of what actions?

1. Rising heights are due to subsidence, and falling heights are due to convection
2. Rising heights are due to convection, and falling heights are due to subsidence
3. Rising heights are due to divergence above the isopycnic level, and falling heights are due to convergence above the isopycnic level
4. Rising heights are due to convergence above the isopycnic level, and falling heights are due to divergence above the isopycnic level

1-5. The level of maximum velocity convergence, located between the 300- and 200-hPa levels, is the primary cause of which of the following conditions?

1. Pressure rises at the surface
2. pressure falls at the surface
3. Height rises in the upper troposphere and lower stratosphere
4. Height falls in the upper troposphere and lower stratosphere

1-6. Assume that the vertical motion is upward and is a result of low-level convergence. This is indicative of what type of circulation?

1. Lower vertical circulation in an anticyclone
2. Upper vertical circulation in an anticyclone
3. Lower vertical circulation in advance of a low
4. Upper vertical circulation in advance of a low

1-7. Maximum horizontal divergence occurs at approximately what pressure level?

1. The 500-hPa level
2. The 400-hPa level
3. The 300-hPa level
4. The 150-hPa level

1-8. What is the result of stratospheric flow over a developing cyclone?

1. Downward vertical motion, and convergence at the level of maximum horizontal divergence
2. Upward vertical motion, and divergence at the level of maximum horizontal divergence
3. Upward vertical motion, and convergence at the level of maximum horizontal divergence
4. Downward vertical motion, and divergence at the level of maximum horizontal divergence

1-9. You are looking downstream and find that high-speed winds are moving towards weak, cyclonically curved contours. What effect should this have on upper-level heights?

1. Heights should decrease downstream to the left
2. Heights should decrease downstream to the right
3. Heights should increase downstream to the left
4. Heights should increase downstream to the right

1-10. When an anticyclonic circulation center is out of phase with its pressure center, what movement(s) bring(s) about a readjustment?

1. The movement of the circulation and pressure centers toward each other
2. The movement of the circulation center toward the pressure center
3. Both 1 and 2 above
4. The movement of the pressure center toward the circulation center

1-11. You encounter a well-developed ridge that has sharply curved anticyclonic contours with a deep trough a short distance downstream. What action should you expect to take place?

1. Deepening and reorientation of a portion of the trough
2. The cutoff low to retrograde from its position and the trough to reorient
3. Dissipation of the low at the lower end of the trough, depending on the initial winds in the ridge to the west
4. Filling and reorientation of the trough

1-12. Under what condition does the greatest overshooting of high-speed winds occur?

1. When high-speed winds in the ridge are more than twice the measured geostrophic winds
2. When measured geostrophic winds in the ridge are more than twice the high-speed winds in the ridge
3. When low-speed winds approach the west side of the anticyclonic ridge
4. When low-speed winds are located in the southwesterly flow of the downstream ridge

1-13. Convergence on the western side of a downstream trough has what results?

1. Dynamic heating
2. A decrease in upper-level heights
3. An increase in upper-level heights
4. A decrease in moisture

1-14. Which of the following statements concerning the convection process is valid?

1. Air-mass stability is increased by the process
2. Air-mass stability is decreased by the process
3. The air mass is compressed
4. Stratiform type clouds predominate in areas of convection

1-15. Upward motion will always result in cloudiness.

1. True
2. False

1-16. When relative vorticity is evaluated, which of the following components of rotational motion should be considered?

1. Wind shear and streamline curvature
2. Wind shear and atmospheric rotation
3. Streamline curvature and atmospheric rotation
4. Atmospheric rotation and cyclostrophic motion

IN ANSWERING QUESTION 1-17, REFER TO FIGURE 1-4 IN YOUR TRAMAN.

1-17. In evaluating relative vorticity from the shear effect alone on straight contours in the northern hemisphere, which evaluations of relative vorticity should you make?

1. Parcel No. 1 has anticyclonic or negative vorticity; Parcel No. 2 has cyclonic or positive vorticity; Parcel No. 3 has zero vorticity
2. Parcel No. 1 has zero vorticity; Parcel No. 2 has anticyclonic or negative vorticity; Parcel No. 3 has cyclonic or positive vorticity
3. Parcel No. 1 has cyclonic or positive vorticity; Parcel No. 2 has anticyclonic or negative vorticity; Parcel No. 3 has zero vorticity
4. Parcel No. 1 has zero vorticity; Parcel No. 2 has cyclonic or positive vorticity; Parcel No. 3 has anticyclonic or negative vorticity

IN ANSWERING QUESTION 1-18, REFER TO FIGURE 1-5 IN YOUR TRAMAN.

1-18. When you are considering the curvature effect alone for an evaluation of relative vorticity, point P is considered to be a point of NO curvature and, therefore, zero vorticity. What is another name for this point of NO curvature?

1. Mid-point of vorticity
2. Point of negative vorticity
3. Point of positive vorticity
4. Inflection point

IN ANSWERING QUESTION 1-19, REFER TO FIGURE 1-9 IN YOUR TRAMAN.

1-19. If only the curvature effect were considered, the relative vorticity would increase in which of the following regions?

1. Regions I and II
2. Regions I and IV
3. Regions II and III
4. Regions III and IV

1-20. When relative vorticity is decreasing downstream in the upper troposphere, what should you expect to occur?

1. Convergence aloft and surface pressure falls
2. Decreased precipitation if sufficient moisture was initially present
3. Decreased thicknesses between standard isobaric surfaces in the region of decreasing relative vorticity
4. Divergence aloft and surface pressure falls

1-21. Long waves of relatively short wavelength, well-defined major troughs and ridges, and well-developed surface cyclones and anticyclones are associated with which of the following wave patterns?

1. Changing long-wave patterns
2. Retrogression of long waves
3. Progressive long waves
4. Stationary long waves

1-22. Which of the following conditions would NOT be an indication of the retrogression of a long wave?

1. Increased cold air advection in the upstream ridge
2. 24-hr height change trajectories do not correspond to the band of maximum winds
3. New height centers appear
4. Surface lows to the west of the major trough position deepen

1-23. Which of the following statements is generally valid when poleward moving jet streams move into the upper midlatitudes?

1. The amplitudes of the long waves decrease
2. Low zonal indexes are reversed
3. The number of long waves increases
4. Associated long waves speed up

1-24. When changes in intensity of troughs and ridges aloft are forecast, the time differential chart is most valuable in forecasting which of the following features?

1. Surface pressure centers
2. Single height change centers with no apparent history
3. Height change centers due to convergence or divergence not associated with a short wave trough or ridge
4. Height change centers with a well-defined history that are associated with short wave troughs and ridges

1-25. You are trying to determine the change in intensity of a long wave trough and you notice that the warm air advection on the east side of the trough is less than the cold air advection on the west side. What intensity change, if any, should you forecast for this trough?

1. It will fill snowy
2. It will deepen
3. It will fill rapidly
4. None

1-26. Which of the following conditions is favorable for the filling of a trough?

1. The strongest winds are on the west side of the trough
2. The strongest winds are on the east side of the trough
3. The strongest winds are at the crest of the associated ridge
4. The strongest winds are in the southern quadrant of the trough

1-27. Upper height falls are associated with low-speed winds approaching straight or cyclonically curved contours.

1. True
2. False

1-28. What seasonal movement and intensity changes occur with the semipermanent high-pressure centers?

1. A poleward movement and decrease in intensity in the summer
2. An equatorward movement and decrease in intensity in the summer
3. A poleward movement and increase in intensity in the summer
4. An equatorward movement and increase in intensity in the summer

1-29. A blocking high at 500-hPa has several closed contours, and the strongest winds in these contours are to the south in the easterlies. What forecast should you make for this high?

1. It will move slowly eastward
2. It will move slowly westward
3. It will move rapidly eastward
4. It will remain stationary

1-30. Intensification of a blocking high will occur under which of the following conditions?

1. During high zonal index conditions
2. When cold air advection and mass convergence occur in the lower troposphere
3. When warm air advection and mass divergence occur in the upper troposphere
4. When cold air advection and mass convergence occur in the upper troposphere

1-31. Concerning the extrapolation of closed lows, which of the following statements is NOT accurate?

1. Extrapolation should only be used for their movement
2. A central height trend over time should be established
3. Changes in intensity may be determined
4. Extrapolation should be used in conjunction with other methods

1-32. A deep low is situated at 50°N, and the closed contours are nearly circular around the center. The strongest winds south of the low have a speed of 50 knots, and from these winds to the center of the low is 5° of latitude. The wind speed to the north of the low is 30 knots. According to the Eccentricity Formula, this low should move in what manner?

1. Eastward at 5.5 knots
2. Westward at 5.5 knots
3. Westward at 1.8 knots
4. Eastward at 1.8 knots

1-33. Which of the following statements is valid concerning the isotherm-contour relationship of lows aloft?

1. If isotherms and contours are out of phase, lows will remain stationary
2. Cold air advection to the west indicates weakening
3. Warm air advection to the east indicates filling
4. Cold air advection to the west indicates retrogression

1-34. The Time-Differential chart shows no height rises for a particular ridge you are forecasting at the 500-hPa level. The 300-hPa chart indicates high-speed winds in the northwestern portion of the ridge approaching anticyclonically curved, weak contours. The advection between the 1000- and 500-hPa levels in that portion of the ridge is warm. What should you forecast for this ridge?

1. The ridge should weaken slowly
2. The ridge should intensify
3. The ridge should weaken rapidly
4. The ridge should remain at its present intensity

1-35. In forecasting the intensity of a particular low, you discover that a jet maximum is located to the west of the low, and it is preceded by another jet maximum downstream beyond the southern periphery of the low. What should you forecast for this low?

1. The low should fill
2. The low should intensify rapidly
3. The low should intensify slowly
4. The low should remain at its present intensity

1-36. Which of the following conditions is NOT an indication that a cutoff low is forming aloft?

1. Height falls are moving south or southeastward
2. Strong cold air advection is on the west side of the trough
3. Strong southwesterlies are situated on the eastern side of the trough
4. Strong northerlies are situated on the western side of the trough

1-37. In the construction of forecasted 500-hPa contours, the change in intensity of a particular system is correlated with all EXCEPT which of the following factors to arrive at specific values for these contours?

1. The sign and the amount of rise and fall in the centers
2. Convergence and divergence at 500-hPa
3. Advection of 50% of the thickness gradient
4. Convergence and divergence in the 850- to 700-hPa stratum

1-38. The comma-shaped cloud formation found on satellite imagery is normally the result of upward motion produced by positive vorticity advection.

1. True
2. False

1-39. The 700-hPa chart is used in the construction of an advection chart for which of the following reasons?

1. It is the most readily available
2. It contains data considered to be the most accurate of any upper-level chart
3. It approximates the contours of the mean wind vector between the 1000- and 500-hPa levels
4. It is considered to be the steering level for cold core highs

1-40. What is the first step you should take when forecasting the movement of pressure systems?

1. Consult your station’s Forecaster’s Handbook
2. Refer to your constructed 1000-500-hPa thickness chart
3. Note the past history of the pressure system
4. Note the thermal characteristics of the pressure system

1-41. If the path of a cyclone indicates its future movement will run into a stationary anticyclone over the eastern Pacific Ocean, which of the following conditions may occur?

1. Its speed will increase, and its path will curve northward paralleling the isobars of the high
2. Its speed will decrease, and it will become quasi-stationary and probably dissipate
3. Its speed will decrease, and its path will curve northward, paralleling the isobars of the high
4. Its speed will decrease, and its path will be perpendicular to the isobars of the high

1-42. Anticyclone centers tend to move toward which of the following areas?

1. Toward the area of greatest pressure rises
2. Toward the area of greatest pressure falls
3. Toward the area of maximum low-level convergence
4. Toward the warm sector isobars

1-43. Warm unoccluded lows move in the general direction of the current in the warm air. What general statement is valid regarding their paths and speed?

1. They usually have straight paths, and their speed is approximately the same as that of the cold front
2. They usually have straight paths, and their speed is somewhat faster than that of the warm air
3. They usually have straight paths, and their speed is about the same as that of the warm air
4. They usually have straight paths, and their speed is somewhat slower than that of the warm air

1-44. Which pressure systems should be considered first when the steering method is used?

1. Warm highs and cold lows
2. Warm highs and warm lows
3. Cold highs and warm lows
4. Cold highs and cold lows

1-45. Assume you are using the steering method to forecast the movement of surface systems in relation to the upper level flow. Where possible, what upper level(s) should you use?

1. Use the 700-hPa level only
2. Use the 500-hPa level only
3. Integrate the results of the 500- and 300-hPa levels
4. Integrate the results of the movement and speed from the 700- and 500-hPa levels

1-46. Assume you are forecasting the movement and speed of a surface low. The upper level winds for the 700-hPa stratum are northwesterly at 20 knots. YOU should forecast this low to move in what manner?

1. In an unknown direction, at a speed of 14 knots
2. In an unknown direction, at a speed of 20 knots
3. Southeastward at 20 knots
4. Southeastward at 14 knots

1-47. When the 500-hPa chart is used for steering a surface system, the orientation of the contours determines the direction of motion. What factor should be used to compute the speed?

1. 50% of the forecast upstream winds for the 24-hr period
2. 50% of the forecast downstream winds for the 24-hr speed
3. 70% of the forecast downstream winds for the 24-hr speed
4. 70% of the forecast upstream winds for the 24-hr speed

1-48. Warm, unoccluded lows tend to move in what direction in relation to the steering current aloft?

1. Slightly to the left of it
2. Slightly to the right of it
3. At right angles to it
4. Parallel to it

1-49. Assume that in an unoccluded low the thickness gradient and the mean wind flow are both strong. In what direction should you expect the low to move?

1. Closer to the direction of the mean wind flow than the thermal wind
2. Closer to the direction of the thermal wind than the mean flow
3. Midway between the direction of the mean flow and the direction of the thickness contours

1-50. Surface lows move with approximately what percent of the thermal wind in the 1000- to 700-hPa stratum?

1. 50%
2. 75%
3. 80%
4. 100%

1-51. Relative to the use of statistical studies in forecasting, which of the following statements is accurate?

1. Valid statistical studies provide the forecaster with virtually infallible rules in making long range forecasts
2. Statistical studies are of little value to the forecaster in predicting the future behavior of storms, as they are mainly for climatological purposes
3. Valid statistical studies should be scrutinized and weighed in light of other factors in the integrated forecast
4. Once a weather situation has been identified, the forecaster can assume the feature will behave in an identical manner

1-52. The objective technique for the prediction of maritime cyclones may be employed for which of the following periods?

1. All maritime cyclones in all seasons of the year
2. All maritime cyclones during the winter months only
3. All maritime cyclones during the summer months only
4. Maritime cyclones whose initial positions are north of 30° latitude during the winter months

1-53. During periods of westerly flow aloft, surface highs tend to migrate in what general manner?

1. Toward the east
2. Poleward
3. Toward areas of decreasing isallobaric gradient
4. Equatorward

1-54. When the direction of movement of a surface low is parallel to the warm sector isobars, it can be expected to deepen with a rate equal to which of the following location pressure tendencies?

1. The warm sector tendency
2. The tendency in advance of the warm front
3. The tendency at the trough line
4. The tendency north of the center of the low

1-55. Wave cyclones are most likely to develop along a front in what location?

1. Along the accelerating portion of a cold front where the 700-hPa winds are parallel to the front
2. Along the decelerating portion of a cold front where the 700-hPa winds are parallel to the front
3. Along the decelerating portion of a cold front where the 700-hPa winds are perpendicular to the front
4. Along the accelerating portion of a cold front where the 700-hPa winds are perpendicular to the front

1-56. A change in pressure at the surface can be estimated to be equal to which of the following conditions?

1. A change in pressure at some level aloft
2. A change in mass between the surface and some upper level
3. A change in pressure at some upper level plus the change in mass between the surface and that upper level
4. A change in pressure at some upper level minus the change in mass between the surface and that upper level

1-57. Concerning the relationship between vorticity aloft and the deepening/filling of surface lows, all EXCEPT which of the following statements is correct?

1. Increasing cyclonic (positive) relative vorticity induces downstream surface pressure falls
2. Increasing anticyclonic (negative) relative vorticity induces downstream surface pressure rises
3. A wave will be stable if the 700-hPa wind over it possesses anticyclonic relative vorticity
4. A wave will be stable if the 700-hPa wind field over it possesses cyclonic relative vorticity

ASSIGNMENT 2

Textbook Assignment: "Forecasting Surface Systems (continued)," and "Forecasting Weather Elements." Pages 3-10 through 4-32.

2-1. When there are several waves along a front, the wave nearest the axis of the trough will normally develop at the expense of the others.

1. True
2. False

2-2. Assume you have a northwestward moving surface low situated over the eastern United States. The low is beneath the 10,700-m contour at the 200-hPa level. It is expected to move northeastward and be located beneath the 10,520-m contour at the 200-hPa level in 24 hr. If you use the approximation method, what would be the expected deepening of the low in 24 hr?

1. 7.2 hPa
2. 10.8 hPa
3. 13.5 hPa
4. 21.0 hPa

2-3. When a surface low moves beneath or ahead of the major ridge position at the 500-hPa level, what changes can be anticipated of the surface low?

1. The surface low will deepen
2. The surface low will fill
3. The associated weather will become more widespread
4. The surface low will move rapidly eastward

2-4. With a southerly flow at the 700-hPa level along the east coast of the United States, where can you anticipate development of a secondary low?

1. The northern Gulf of Mexico
2. Over the gulf states
3. Offshore, New England
4. The vicinity of Cape Hatteras

2-5. What would most likely occur in the lower stratosphere above the 300-hPa level if the column of air in a deepening low below the 300-hPa level were to become colder?

1. Subsidence in the lower stratosphere, resulting in warming and lowering of the constant pressure surfaces
2. Convergence in the lower stratosphere, resulting in cooling and lowering of the constant pressure surfaces
3. Subsidence in the lower stratosphere, resulting in cooling and lowering of the constant pressure surfaces
4. Convergence in the lower stratosphere, resulting in warming and lowering of the constant pressure surfaces

IN ANSWERING QUESTION 2-6, REFER TO FIGURE 3-8 IN YOUR TRAMAN.

2-6. Which of the following assumptions can be made from figure 3-8?

1. A surface high would exist to the left
2. The level of equal density is above the 200-hPa level
3. The tropopause layer is not significantly altered by the upper high
4. All of the above assumptions can be made

2-7. Assume that the upper current over a surface low is undisturbed and the low is deviating to the left of the upper contours (looking downstream). What should you forecast for this low?

1. The low should fill
2. The low should deepen
3. The low should split
4. The low should remain unchanged

2-8. Deepening lows always move more slowly than filling lows.

1. True
2. False

2-9. In the development of an anticyclone, what changes occur in the troposphere and lower stratosphere?

1. Warming occurs both in the 400- to 200-hPa stratum, and in the lower troposphere due to subsidence
2. Cooling occurs above the 400- to 200-hPa stratum, and warming occurs in the lower troposphere due to convergence
3. Warming occurs in the 400- to 200-hPa stratum due to subsidence, and cooling occurs in the lower troposphere due to convergence
4. Cooling occurs above the 200-hPa level due to convergence in the 400- to 200-hPa stratum, and warming occurs in the lower troposphere

2-10. Assume you are forecasting a surface high. YOU find that the 500-hPa height is NOT forecasted to increase, although convergence is occurring above 500 hPa. What should you forecast for this high?

1. It will split
2. It will weaken
3. It will intensify
4. It will remain unchanged in intensity

2-11. In regard to satellite imagery interpretation of intensity changes of surface cyclones, which of the following statements is valid?

1. Filling is indicated when Positive Vorticity Advection (PVA) becomes broader
2. High clouds surrounding a vortex indicate cold air advection
3. High and/or middle clouds surrounding a vortex indicate the cyclone has reached maturity
4. Deepening is indicated when PVA becomes narrower

2-12. The forecasting of frontal displacement by the geostrophic wind method should be based on which of the following components?

1. The geostrophic wind component parallel to the front obtained at the time of the forecast
2. The geostrophic wind component normal to the front obtained at the time of the forecast
3. A forecast of the mean component of the geostrophic wind, parallel to the front, which is expected to prevail during the forecast period
4. A forecast of the mean component of the geostrophic wind, normal to the front, which is expected to prevail during the forecast period

2-13. You should expect a front to have a rapid west-east movement with little southward penetration during what index cycle?

1. A low zonal index
2. A high zonal index
3. A changing zonal index
4. A decreasing zonal index

2-14. Which of the following movements would NOT indicate intensification of a surface front?

1. The surface front approaches a deep upper level trough
2. The mean isotherms become more normal to the surface front
3. The mean isotherms become more parallel to the surface, and tend to pack
4. Both air masses have strengthened due to the underlying surface

2-15. When the mean isotherms associated with a frontal system become more perpendicular to the surface front, what process should be anticipated?

1. Frontogenesis
2. Frontolysis
3. Cyclogenesis
4. Cyclolysis

2-16. Assume you a forecasting an isobar over you station. You find that the current 500-hPa height over your station is 5580-m and the forecasted value is 5640-m. The current 1000- to 500-hPa thickness is 5640-m, and the forecasted value is 5520-m. The current sea level pressure is 1029.0 hPa. What value should you forecast for the sea level pressure?

1. 1014.0 hPa
2. 1021.5 hPa
3. 1036.5 hPa
4. 1044.0 hPa

2-17. Which of the following processes is capable of producing precipitation in appreciable amounts.

1. Nonadiabatic cooling
2. Adiabatic lifting of air
3. Evaporation of additional moisture into the air
4. Radiation and conduction associated with advection

2-18. Adiabatic lifting of air can be caused by all EXCEPT which of the following cooling processes?

1. Frontal lifting
2. Orographic lifting
3. Vertical stretching
4. Horizontal divergence

2-19. Which of the followinq cooling processes is the most-effective and intensive?

1. Frontal lifting
2. Orographic lifting
3. Vertical stretching
4. Horizontal divergence

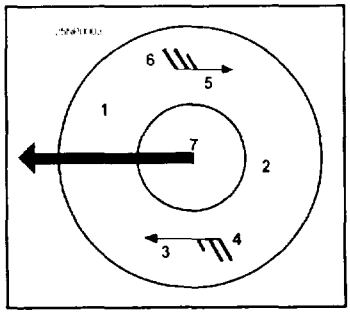


Figure 2-A

IN ANSWERING QUESTION 2-20, REFER TO FIGURE 2-A.

2-20. The most marked convergence occurs at what position?

1. 1
2. 2
3. 7
4. 4

2-21. Horizontal convergence, orographic lifting, or frontal lifting acting alone or in combination with one another can occur in any particular weather situation.

1. True
2. False

2-22. Which of the following processes will NOT prevent precipitation by increasing the temperature of the air?

1. Air descending the lee side of a mountain
2. Air descending from aloft to compensate for divergence of air from another region
3. Air descending because the mass ahead of a front is moving with a relative component away from the front
4. Air ascending the lee side of a mountain

2-23. When frontal weather extends far behind a surface cold front, the 700-hPa level isoheights will be at what relative position?

1. Perpendicular to the surface front
2. Parallel to the upper front
3. Parallel to the surface front
4. Perpendicular to the isotherms

2-24. Well-developed cloud bands noted on satellite imagery are associated with active cold fronts at the surface, and are the result of which of the following processes?

1. The veering of the winds aloft associated with the surface f rent
2. The backing of the winds aloft associated with the surface front
3. An upper wind flow that is nearly perpendicular to the frontal zone
4. An upper wind flow that is parallel, or nearly parallel, to the frontal zone

2-25. Excluding the cirrus cloud shield, what is considered to be the forward limit of warm frontal cloudiness?

1. The 500-hPa ridge ahead of the front
2. The 700-hPa ridge ahead of the front
3. The 850-hPa ridge ahead of the front
4. The 925-hPa ridge ahead of the front

2-26. The slope of a warm front is nearly horizontal near the surface, but is steep several hundred miles to the north. Where should the heaviest precipitation occur?

1. At the surface front
2. Immediately behind the surface front
3. South of the surface front
4. Where the slope of the surface front is greatest

2-27. What type of flow aloft tends to diminish cloudiness and precipitation?

1. Convergent flow
2. Cyclonic flow
3. Straight flow
4. Anticyclonic flow

2-28. Open cellular clouds are typically found in which of the following locations?

1. Stable air masses
2. The area immediately ahead of cold fronts
3. The cold air side of a cold front
4. The warm air side of a warm front

2-29. Closed cellular clouds are predominately composed of which of the following elements?

1. Cumuliform elements
2. Stratocumulus elements
3. Stratiform elements
4. Cirriform elements

2-30. Which of the following conditions is indicative of “fair weather”?

1. The relative vorticity increases downstream along the streamlines
2. The relative vorticity decreases downstream along the streamlines
3. The relative vorticity increases upstream along the streamlines
4. The relative vorticity remains constant along the streamlines

2-31. Satisfactory forecasting of the movement of precipitation areas by using isochrones may be obtained if the isochrones indicate areas that have what type of precipitation?

1. Continuous precipitation
2. Showery precipitation only
3. Intermittent precipitation only
4. Either showery or intermittent precipitation

2-32. Relative to the behavior of the cloud base and ceiling in an area of continuous precipitation, which of the following statements is accurate?

1. Both the ceiling and the cloud base will drop rapidly
2. Both the ceiling and the cloud base will drop gradually
3. The ceiling will drop gradually, and the cloud base will drop rapidly
4. The ceiling will drop rapidly, and the cloud base will drop gradually

2-33. Before an extrapolation of ceiling trends can be made by using the x-t diagram, which of the following conditions may necessitate the smoothing of the “curves”?

1. Diurnal ceiling fluctuations
2. Ceiling irregularities caused by topographic influences
3. Rapid and erratic up-and-down fluctuations of the ceiling
4. All of the above

2-34. What should be the first step in the construction of a “trend chart”?

1. Determine the source direction of the weather
2. Identify predictor station(s)
3. Determine the “critical factor”
4. Analyze the mesoscale situation

2-35. "Time-liners" are particularly useful for making the analysis and extrapolation of which of the following aids?

1. Trend charts only
2. Time-distance charts only
3. Isochrone analyses
4. Trend and time-distance charts

2-36. The temperature and dewpoint curves constructed on a RAOB may be used to determine the presence and thickness of cloud layers, as well as potential areas of cloud formation.

1. True
2. False

2-37. The temperature to which air must be cooled or heated adiabatically to reach saturation with respect to ice is the definition of what meteorological term?

1. Dewpoint
2. Potential temperature
3. Frost point
4. Relative humidity

2-38. Under what condition will the true temperature lie between the true dewpoint and the true frost point in a cloud?

1. When the cloud consists entirely of super-cooled water droplets
2. When the cloud temperature is above freezing
3. When the cloud consists entirely of ice crystals
4. When the temperature is representative of the sub-freezing portion of a cloud

2-39. A cirrus cloud is saturated with respect to water with a dewpoint of -31°C. What is the correct frost point to the nearest whole degree?

1. -22°C
2. -28°C
3. -34°C
4. -40°C

2-40. Assume that a sounding indicates a layer of moderate decrease in dewpoint depression, followed by another layer of stronger decrease in dewpoint depression. What assumption can be made relative to the cloud layer associated with the depression?

1. The top of the cloud layer should be identified with the base of the stronger decrease
2. The top of the cloud layer should be identified with the weaker decrease
3. The base of the cloud layer should be identified with the base of the stronger decrease
4. The base of the cloud layer should be identified with the base of the weaker decrease

IN ANSWERING QUESTION 2-41, REFER TO FIGURE 4-19 IN YOUR TRAMAN.

2-41. What is the probability of clear or scattered conditions when a sounding that terminated at the 850-hPa level indicates a dewpoint depression of 6°C?

1. 20%
2. 35%
3. 60%
4. 70%

2-42. Assume a 500-hPa level dewpoint depression analysis is constructed to determine the probable cloud areas. Where would cloud layers be indicated?

1. At the 500-hPa level only
2. At and below the 500-hPa level only
3. At and above the 500-hPa level only
4. At, above, and below the 500-hPa level

2-43. What is the greatest factor in determining the type and intensity of precipitation observed at the surface?

1. Cloud types
2. Thickness of the cloud types
3. Height of the base of the clouds
4. Temperature in the upper portion of the clouds

2-44. Most high-level jet operational problems are created by what type of cirriform clouds?

1. Cirrouncinus
2. Cirrocumulus
3. Cirrostratus
4. Cirrus (proper)

2-45. In the upper troposphere, what is the result of the slow ascent of air that has insufficient freezing nuclei in the higher levels?

1. The formation of cirrus haze
2. The formation of cirrocumulus clouds
3. The formation of cirrostratus clouds
4. The formation of “anvil” cirrus clouds

2-46. Assume that an aircraft is to fly through thin cirrus clouds in which the temperature is -35°C and the dewpoint is -37°C. What aircraft visibility should be forecasted?

1. 1 mile
2. 2 miles
3. 3 miles
4. 7 miles

2-47. A ridge line is approaching your station. You should forecast extensive cirrostratus clouds to occur at what period?

1. Before arrival of the 500-hPa ridge line
2. After passage of the 500-hPa ridge line
3. Before arrival of the surface ridge line
4. After passage of the surface ridge line

2-48. The mean height of the bases of cirriform clouds are greater at the equator than in the mid-latitudes.

1. True
2. False

2-49. Where are the densest and most extensive cirrus clouds found relative to the jet stream?

1. Below the jet stream axis
2. Above the jet stream axis
3. Poleward of the jet stream axis
4. Equatorward of the jet stream axis

2-50. The correct prediction of rain versus snow at a location depends mostly upon which of the following factors?

1. The height of the cloud bases
2. The temperature at the surface
3. The height of the freezing level
4. The temperature at the base of the cloud

2-51. In most precipitation situations, warming in the lower troposphere is generally expected to accompany the precipitation due to which of the following movements?

1. Strong warm air advection and upward vertical motion
2. Strong warm air advection and downward vertical motion
3. Cold air advection and strong upward vertical motion
4. Cold air advection and strong downward vertical motion

2-52. What is the primary cause of the lowering of the “bright band” within the first 1 1/2 hours after the onset of precipitation?

1. Vertical motion
2. Horizontal advection
3. Evaporational cooling
4. Combined effects of all of the above

2-53. A rain-snow zone is most closely tied to which of the following factors?

1. The position of the warm front
2. The position of the polar front
3. The direction of the surface winds
4. The track of the surface disturbance

2-54. Which of the following local thermal parameters used in a snow versus rain forecast is the LEAST reliable when considered by itself?

1. Stratum thickness
2. Surface temperature
3. Upper level temperature
4. Freezing level height

2-55. Wagner's study of the 1000- to 500-hPa thickness as a predictor of precipitation type in the United States verified which of the following statements?

1. Critical thickness values increase with increasing altitude
2. Critical thickness values increase with decreasing altitude
3. Critical thickness values decrease with increasing altitude
4. Critical thickness is unaffected by increasing or decreasing altitude

2-56. During periods of normal winter conditions, how far upstream should you look in forecasting a 24-hour temperature?

1. 200 nm
2. 300 nm
3. 400 nm
4. 500 nm

2-57. In what area of a blizzard should you expect maximum snowfall?

1. To the left of the storm's track
2. To the right of the storm's track
3. Along the storm's track
4. 100 to 300 nm equatorward of the storm's track

2-58. Which of the following is a characteristic of a warm advection type snowstorm?

1. An occluded low-pressure center to the east
2. A strong, active low-pressure center in the vicinity of the maximum snowfall area
3. The absence of a low-pressure center in the vicinity of the maximum snowfall area
4. An unoccluded low-pressure center to the east

2-59. What type of snowstorm may occur when a sharp, north-south oriented cold front lies in a deep trough?

1. Post-cold frontal
2. Warm advection
3. Major snowstorm
4. Blizzard

2-60. Maximum snowfall at any one station is of shortest duration if the snowstorm is of what type?

1. Blizzard
2. Warm advection
3. Post-cold frontal
4. Major storm

2-61. What 850-hPa level moisture isopleth and isotherm are used as the defining line for locating areas of maximum snowfall in the Great Lakes region of the United States?

1. The -10°C dewpoint isopleth and the -3°C isotherm
2. The -10°C dewpoint isopleth and the 0°C isotherm
3. The -5°C dewpoint isopleth and the -3°C isotherm
4. The -5°C dewpoint isopleth and the 0°C isotherm

2-62. Assume that yesterday the maximum temperature was 15°F and the lapse rate was stable; today, the lapse rate has become unstable while sky conditions have remained the same. How will today's temperature compare with yesterday's?

1. It will be greater
2. It will be the same
3. It will be less

2-63. all EXCEPT which of the following characteristics are prerequisites for a cold wave over the United States?

1. Strong northerly or northwesterly flow develops aloft over west central Canada
2. A strong ridge exists over the eastern portion of the United States
3. Intense southwesterly flow develops over the eastern Pacific ocean
4. An extremely cold Arctic air mass exists over west central Canada

2-64. A stationary long wave trough over the Rocky mountains in the summer always warns of a "heat wave" for the eastern United states.

1. True
2. False

ASSIGNMENT 3

Textbook Assignment: "Forecasting Severe Weather Features," and "Sea Surface Forecasting." Pages 5-1 through 6-18.

3-1. At what stage(s) in the life cycle of a thunderstorm should you expect updrafts to occur from below the base to the top of the cloud?

1. The cumulus stage
2. The mature stage
3. The dissipating stage
4. Throughout all stages

3-2. The least severe turbulence associated with thunderstorms is generally found at what location?

1. Near the top of the cloud
2. Near the base of the cloud
3. Near the freezing level
4. 1500 ft above the freezing level

3-3. Hail is associated with the mature stage of a thunderstorm and is found with the greatest frequency between which levels?

1. The surface and 5,000-ft level
2. The 5,000- and 10,000-ft level
3. The 10,000- and 15,000-ft level
4. The 15,000- and 20,000-ft level

3-4. When the intensities of turbulence and precipitation are compared, what relationship should be assumed?

1. Turbulence intensity varies inversely with precipitation intensity
2. Turbulence intensity varies directly with precipitation intensity
3. The relationship between turbulence and precipitation intensities is dependent on the size of the thunderstorm
4. Turbulence intensity is not related to precipitation

3-5. Which of the following activities produces electrical charges in cumulonimbus clouds?

1. Raindrops falling through the cloud produce static charges
2. The passage of another cloud with opposite polarity
3. A cloud passing in the vicinity of a high electrical field of opposite polarity
4. Opposite polarity within the cloud relative to the earth's surface

3-6. In what area of a thunderstorm does lightning most frequently occur?

1. Immediately beneath the storm
2. In areas with temperatures in the range of 0°C to -9°C
3. Within the "anvil" atop the cumulonimbus cloud
4. At the trailing edge of the thunderstorm

3-7. What is the primary in-flight hazard associated with lightning?

1. Injury to personnel
2. Discomfort for personnel
3. Damage to radio equipment
4. Damage to aircraft structural components

3-8. Severe turbulence in thunderstorms is most frequently encountered within what stratum?

1. The 5,000- and 10,000-ft level
2. The 7,500- and 12,000-ft level
3. The 8,000- and 15,000-ft level
4. The 10,000- and 20,000-ft level

3-9. Lightning strikes are most likely to occur within which of the following thermal stratums?

1. Near or slightly above the 0°C isotherm level
2. Near or slightly above the -5°C isotherm level
3. Near or slightly below the -10°C isotherm level
4. Near or slightly above the -15°C isotherm level

3-10. The mass of cool air that spreads out at the base of a thunderstorm as a result of downdrafts may develop into which of the following features?

1. A small low-pressure area
2. A small high-pressure area
3. A squall line
4. A microscale thunderstorm

3-11. How do pressure changes associated with a thunderstorm influence aircraft altimeter readings?

1. The altimeter reading decreases as the storm approaches and remains low until the storm moves away
2. The altimeter reading increases as the storm approaches, decreases while in the rain showers, and returns to normal as the storm moves away
3. The altimeter reading decreases in the cumulus stage of the thunderstorm, increases in the mature stage of the thunderstorm, and returns to normal in the dissipation stage
4. The altimeter reflects decreasing altitudes as the aircraft approaches the thunderstorm, increased altitude as the aircraft flies through the rain, and returns to normal as the aircraft flies away from the storm

3-12. A pilot sets the altimeter immediately before the passage of a thunderstorm. Following the passage of the thunderstorm, what should the altimeter read?

1. High
2. Low
3. Accurate

3-13. When the parcel method is analyzed on a Skew T log P diagram and used to forecast thunderstorms, which of the following statements is valid?

1. With a large positive area, thunderstorms may be forecast with a high degree of confidence
2. When thunderstorms are not indicated, you may safely assume that no thunderstorms will occur
3. The parcel method gives little indication of stability or instability when used alone as a forecasting aid
4. The size of the positive area is a good indication of instability, but other factors, such as the distribution of low tropospheric moisture, should be considered

3-14. Which parcel method condition, when considered alone, would NOT be favorable for thunderstorm development?

1. The negative energy area exceeds the positive energy area
2. The positive energy area exceeds the negative energy area
3. An ample supply of moisture is uniformly distributed throughout the lower troposphere
4. The parcel will rise to a temperature level of -10°C

IN ANSWERING QUESTION 3-15, REFER TO FIGURE 5-3 IN YOUR TRAMAN.

3-15. From an analysis of figure 5-3, you should draw which of the following conclusions?

1. The base of the inversion can be safely assumed to be the top of cumulus activity
2. Sufficient heating during the day will dissipate the low-level inversion; therefore, a forecast of thunderstorm activity may be made
3. In spite of favorable lapse rate conditions, there is insufficient moisture for thunderstorm development
4. Although the positive energy areas exceed the negative energy areas, due to the intensity of the low-level inversion, thunderstorms would probably not form

3-16. When the parcel method for mechanical lifting is used, what level(s) is/are determined on the Skew T log P diagram?

1. LCL
2. LFC
3. Both 1 and 2 above
4. LND

3-17. Which of the following procedures is NOT used in discounting regional forecasting of air-mass thunderstorms?

1. Dewpoint depressions of 13°C or more at any level within the 850- to 700-hPa stratum
2. Dry air advection in the lower levels
3. Freezing levels below 12,000 ft in an unstable cyclonic flow producing only light showers
4. Dewpoint depressions of 15°C or greater at the 700- to 600-hPa levels

3-18. Stability indexes are most valuable in forecasting thunderstorms or showers in which of the following situations?

1. When used to forecast thunderstorm or shower activity for individual locations
2. When plotted and analyzed on stability index charts for large areas, and evaluated in light of other synoptic considerations
3. When plotted and analyzed on stability index charts and when used alone as indicators of probable thunderstorm activity
4. When plotted for several locations, and conclusions of possible thunderstorm or shower activity are arrived at for each location in light of surrounding locations

3-19. When Showalter Index computations reveal an index of -4°C, what should be indicated for thunderstorm activity?

1. Light thunderstorms
2. Moderate thunderstorms
3. Severe thunderstorms
4. No thunderstorm activity

3-20. The occurrence of a tornado is possible if a Showalter Index of

1. greater than 3°C is computed
2. less than -2°C is computed
3. greater than 6°C is computed
4. less than -6°C is computed

3-21. Which of the following statements regarding the movement of thunderstorms relative to upper-level wind direction and speed is valid?

1. Upper-level wind direction and speed can be used as a guide in forecasting thunderstorm movement, but without a great deal of confidence
2. Upper-level wind direction and speed can be used with considerable confidence in forecasting the direction of, but not the speed of movement of thunderstorms
3. Upper-level wind direction and speed can be used with confidence in forecasting the speed of movement, but not the direction of thunderstorms
4. The 700-hPa level winds can be used with a considerable degree of accuracy in forecasting both the speed and direction of movement of thunderstorms

3-22. Within the 10,000- to 20,000-ft stratum, most hail is encountered outside the thunderstorm.

1. True
2. False

3-23. Which of the following phrases defines the Equilibrium level (EL) as used in the Yes-No hail forecasting technique?

1. The top of a negative area in a sounding where the saturation adiabat traced from the CCL intersects the temperature curve
2. The top of the lowest positive area at the intersection of the dry adiabat
3. The top of a positive area in a sounding where the saturation adiabat traced from the CCL intersects the temperature curve
4. The area between the first positive and negative energy areas

3-24. When preparing hail size forecasts by using the Skew T log P diagram, you should trace the moist adiabat upward from the CCL to what dry-bulb temperature level?

1. 0°F
2. 0°c
3. -5°F
4. -5°C

3-25. Most tornadoes in the United States occur during what season(s) of the year?

1. Fall
2. Midwinter
3. Summer and early fall
4. Spring and early summer

3-26. Which type of tornado is normally associated with squall lines?

1. Great Plains
2. Gulf Coast
3. West Coast
4. Eastern

3-27. Although the phenomena are not similar, the formation of both thunderstorms and fog originates in a moist, unstable air mass.

1. True
2. False

3-28. Frontal fog would be LEAST likely to form in which of the following areas?

1. In advance of a warm front
2. To the rear of a slow-moving cold front
3. To the rear of a fast-moving cold front
4. In the warm sector of a low-pressure area

IN ANSWERING QUESTION 3-29, REFER TO FIGURE 5-17 IN YOUR TRAMAN.

3-29. Assume that smoke was present during the day and night preceding the fog formation indicated in figure 5-17. What should be your forecast time of fog formation?

1. 0230 local standard time
2. 0330 local standard time
3. 0430 local standard time
4. 0530 local standard time

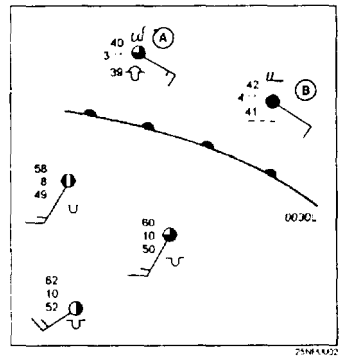


Figure 3-A

IN ANSWERING QUESTION 3-30, REFER TO FIGURE 3-A.

3-30. The warm front depicted in figure 3-A is located 40 miles southwest of stations A and B. It is forecast to move northeastward at 20 knots, and is expected to pass stations A and B at approximately 0230 local standard time. The wind will shift to the southwest at 16 knots What should be your forecast for stations A and B at 0430 local standard time?

1. Heavy fog with possible drizzle
2. Moderate fog with possible drizzle
3. Low stratus clouds and possible drizzle
4. Stratocumulus clouds with unrestricted visibility

3-31. Which of the following meteorological situations is most favorable for the formation of radiation fog?

1. A clear, cool night with strong winds in a fast-moving, high-pressure area
2. A cloudy, warm night with light breezes in the warm sector of a low-pressure area
3. A clear, cool night with light breezes in a stationary high-pressure area
4. A sultry, humid evening with calm winds in the warm sector of a low-pressure area

3-32. What type of fog is formed when a warm, rainy air mass overrides a stable, continental polar (cP) air mass?

1. Frontal passage fog
2. Postfrontal fog
3. Radiational fog
4. Prefrontal fog

3-33. Postfrontal fog may be formed under which of the following conditions?

1. Two air masses are near saturation and accompanied by light winds
2. The postfrontal air mass is temporarily heated from below
3. Hydrocarbon fuels are present with a quasi-stationary frontal system
4. A quasi-stationary east-west oriented cold front is present and the continental polar air behind the front is stable

3-34. Frontal passage fog may form where associated air masses are near saturation, with light frontal winds.

1. True
2. False

3-35. Sea fogs tend to dissipate under which of the following conditions?

1. When the winds are greater than 6 knots
2. When the underlying water continually becomes colder
3. When there is radiational cooling from the warm water
4. When the sea fog flows over warm land

3-36. Assume that a sounding is taken at a time when stratus clouds are observed over your location. Which of the following conditions will usually exist near the surface?

1. A moist adiabatic lapse rate
2. A dry adiabatic lapse rate
3. A shallow convective cloud deck
4. A temperature inversion

3-37. You are using the dry adiabatic method to predict the height of the top of a layer of fog. The average mixing ratio line intersects the temperature curve at 20°C, and the dry adiabat of this intersection reaches the surface level at a temperature of 30°C. The top of this layer of fog will be at what height?

1. 1,000 ft
2. 1,640 ft
3. 3,280 ft
4. 5,280 ft

3-38. The "critical temperature" is the surface temperature at which fog will

1. form, provided no changes have taken place in the sounding
2. dissipate, regardless of changes in the sounding
3. dissipate, provided no changes have taken place in the sounding
4. form, regardless of changes in the sounding

3-39. A stratus layer is over your station when you take a morning sounding at 0600 local standard time, with a surface temperature of 8.5°C. The surface temperature at which dissipation will begin is computed to be 16°C, with dissipation to be complete when the temperature reaches 24°C. If heating is forecast to increase at the rate of 4°C per hour for the first 2 hours, and 6°C per hour for the next 3 hours, at what time should you forecast the stratus layer to dissipate?

1. 0915 local standard time
2. 0945 local standard time
3. 1015 local standard time
4. 1045 local standard time

3-40. What causes a supercooled water droplet to freeze on contact with an aircraft at -3°C when it will not normally freeze until the temperature is between -10°C and -40°C?

1. The internal stability of the droplet is destroyed when it strikes the aircraft, and its freezing point is raised
2. The surrounding air temperature is below 0°C, causing the water droplets to freeze immediately
3. The airflow created by the engine creates sufficient disturbance to destroy the stability of the water droplets
4. Supercooled water droplets normally freeze at -3°C

3-41. In the course of a flight from takeoff to landing, at what stage is a turbojet aircraft LEAST susceptible to icing?

1. When in the landing pattern
2. When taking off
3. When in final approach
4. At cruising altitude and speed

3-42. In which of the following meteorological situations should you forecast the greatest probability of aircraft icing?

1. Cold air advection, temperature of -5°C, and dewpoint depression of 2°C
2. Cold air advection, temperature of -7°C, and dewpoint depression of 3°C
3. Warm air advection, temperature of -15°C, and dewpoint depression of 4°C
4. Warm air advection, temperature of -10°C, and dewpoint depression of 3°C

IN ANSWERING QUESTION 3-43, REFER TO FIGURE 5-20 IN YOUR TRAMAN.

3-43. Assume that you have weak cold air advection between approximately 9,000 and 12,000 ft. On the basis of the temperatures and the dewpoint depressions, what should your icing intensity forecast be for this area?

1. Light
2. Moderate
3. Severe
4. Extreme

IN ANSWERING QUESTION 3-44, REFER TO FIGURE 5-21 IN YOUR TRAMAN.

3-44. What determines the intensity of expected icing?

1. The size of the hatched area
2. The value of the combined dewpoints
3. The size of the area between the temperatures and the dewpoints
4. The stability of the air mass

3-45. Which of the following icing conditions should be expected if the -8D curve is to the left of the temperature curve in an area with temperatures ranging from -10 to -18°C?

1. Light glaze icing
2. Light rime icing
3. Light hoarfrost
4. No icing

3-46. Wind shear produces turbulence because of eddies created due to tight vertical or horizontal gradients in wind velocity in a specific direction along the same line.

1. True
2. False

3-47. A pilot files a DD Form 175-1 for an IFR flight in a P-3 aircraft along a route that will cross over a mountainous area where mountain waves exist. If the height of the tallest en route peak is 5,280 ft, and the pilot can NOT avoid the area, what is the minimum altitude the pilot must maintain in flying over the area?

1. 3,440 ft
2. 7,920 ft
3. 11,160 ft
4. 11,280 ft

3-48. Turbulent eddies on mountain ridges usually exist in much deeper layers on what part of the slope?

1. At the highest peak
2. At the lowest base
3. On the windward side
4. On the leeward side

3-49. Clear air turbulence (CAT) is most frequently encountered in the winter months.

1. True
2. False

3-50. CAT occurs primarily at which of the following locations?

1. Poleward of the jet stream core
2. Equatorward of the jet stream core
3. Within the jet stream core
4. At the 40,000-ft level in warm troughs

3-51. Which of the following statements is NOT a valid characteristic of sea waves?

1. Sea waves are created by local winds
2. Sea waves are composed of a small spectrum of sine waves
3. Sea waves remain in their generating area
4. Sea waves are very irregular in appearance

3-52. What is the relationship, if any, between wave amplitude and wave height?

1. Wave amplitude equals one-half the wave height
2. Wave amplitude equals the wave height
3. Wave amplitude is twice the wave height
4. None

3-53. State the relationship between wave frequency and wave period?

1. Wave frequency is twice the wave period
2. The lower the wave frequency, the longer the wave period
3. Wave frequency equals one-half the wave period
4. The greater the wave frequency, the longer the wave period

3-54. If the mean period of a group of waves is 1.5 see, what would be the group wave speed?

1. 6 knots
2. 2 knots
3. 8 knots
4. 4 knots

3-55. What is the significance of the filter area in swell wave forecasting?

1. The filter area allows only certain frequencies of swell waves to arrive at the forecast point
2. The filter area has little significance in swell wave forecasting
3. The filter area allows all frequencies of swell waves to arrive at the forecast point
4. The filter area allows only high frequency swell waves to arrive at the forecast point

3-56. What is the importance, if any, of the significant frequency range?

1. Low value frequencies with E-values greater than 5% are eliminated
2. It determines the range of periods at the forecast point
3. High value frequencies with E-values greater than 3% are eliminated
4. None

3-57. When, if ever, does the energy transfer from the wind to the sea wave cease?

1. When the speed of the sea wave equals the speed of the wind
2. When the speed of the sea wave exceeds the speed of the wind
3. When the speed of the sea wave first exceeds one-half the wind speed
4. Never

3-58. Which of the following statements is NOT accurate regarding fully developed seas?

1. Generated wave frequencies equal to or greater than the minimum frequency for the wind speed may be propagated
2. The leeward portion of the fetch area is in a steady state
3. Sea waves can not be generated at higher heights than the maximum value for the wind speed
4. The windward portion of the fetch is in a steady state

3-59. What is the first step in preparing a wave forecast?

1. Determine the duration of the winds
2. Determine a representative wind speed
3. Determine a representative wind direction
4. Locate the fetch area

3-60. Which of the following is the LEAST accurate measure of wind speed over a fetch area?

1. Ship observations
2. Reports from ships traveling in opposing directions
3. Uncorrected geostrophic winds
4. Corrected geostrophic winds

3-61. Which of the following statements regarding curvature corrections is accurate?

1. Add a 10% correction to the geostrophic wind for moderately curved cyclonic curvature
2. Straight isobars over shallow basins require a 10% correction
3. For isobars with sharp cyclonic curvature, decrease the geostrophic wind by 10%
4. For isobars with sharply curved anticyclonic curvature, decrease the geostrophic wind by 10%

3-62. The fact that longer period waves move faster than shorter period waves is best described by what term?

1. Dispersion
2. Angular spreading
3. Ekman spiral
4. Spatial spreading

3-63. Which of the following characteristics is NOT affected when a wave “feels” bottom?

1. Wave length
2. Wave period
3. Wave speed
4. Wave direction

3-64. The bending of a wave to conform to bottom contours is a definition of what term?

1. Shoaling
2. Diffraction
3. Angular spreading
4. Refraction

3-65. Which type of breaker is characterized by a loud, explosive sound?

1. A spilling breaker
2. A surging breaker
3. A plunging breaker
4. A cresting breaker

3-66. Surf zone width is normally measured in what increments?

1. Feet
2. Meters
3. Yards
4. Fathoms

3-67. The Modified Surf Index is NOT applicable to which of the following landing craft?

1. LARC
2. LCM-8
3. LCAC
4. LVTP-5

3-68. What type of currents are most pronounced in the entrances to large tidal basins?

1. Coastal currents
2. wind-driven currents
3. Eddy currents
4. Tidal currents

ASSIGNMENT 4

Textbook Assignment: "Meteorological Products and Tactical Decision Aids," "Oceanographic Products and Tactical Decision Aids," "Operational Oceanography" and "Special Observations and Forecasts." Pages 7-1 through 10-12.

4-1. The Electronic Countermeasures (ECM) effectiveness display provides airborne jammer effectiveness for a maximum of how many ranges?

1. 10
2. 7
3. 5
4. 4

4-2. Which of the following parameters is NOT an input to the D-Value (DVAL) program?

1. Temperature
2. Pressure level in feet
3. Specification of output units
4. Specification of output altitude increments

4-3. Which of the following factors is considered the primary cause of EM propagation loss with regard to the Battle Group Vulnerability (BGV) product?

1. Water vapor
2 Refraction
3. Haze
4. Obstructions to vision

4-4. The Electromagnetic Path Loss (LOSS) program is valid only for EM systems with frequencies between what range?

1. 10 Hz and 100 Hz
2. 100 Hz and 1 MHz
3. 1 MHz and 1 GHz
4. 100 MHz and 20 GHz

4-5. What is the maximum intercept range available when you use the Electronic Support Measure (ESM) program?

1. 100 km
2. 500 km
3. 1,000 km
4. 10,000 km

4-6. The Platform Vulnerability (PV) program assumes emitters are radiating at what power level?

1. Average power level
2. Minimum power level
3. Maximum power level
4. Multiple power level

4-7. Which of the following statements is accurate concerning detection ranges in the Surface-Search Radar Range (SSR) tables?

1. There are three screen outputs
2. Ranges are expressed in metric units only
3. Detection ranges represent average distances to the objects only
4. Detection ranges represent minimum, average, and maximum ranges to the objects

4-8. The coverage display model can be used for all EXCEPT which of the following applications?

1. Airborne or surface-based surface-search radars employed against surface targets
2. Long-range air-search radars, surface-based or airborne
3. Surface-search radars when employed against low-flying targets
4. Sonobuoys (with proper antenna height and frequency)

4-9. The function of the coverage display model is to calculate the maximum radar range for a given radar and target.

1. True
2. False

4-10. The Ship Ice Accretion (SHIP ICE) program algorithm considers air temperatures in what range?

1. 35°F to -10°F
2. 33°F to -5°F
3. 0°c to -21°C
4. -2°C to -21°C

4-11. What equivalent explosive weight is used with the Sound Focus (SOCUS) program in a reduced charge muzzle blast from a 16-inch naval gun?

1. 66 lb
2. 198 lb
3. 330 lb
4. 400 lb

4-12. Which of the following statements is valid concerning the Laser Range Prediction (LRP) program?

1. The program's Night/Day display incorporates several sets of eye apertures for various exposures
2. The program operates on a frequency specified basis
3. The program is not to be used for air-to-air scenarios
4. Data-base computations select the pulse repetition frequency for the minimum power of a particular radar

4-13. What is the minimum requirement, if any, for the upper air-sounding used with the Ballistic Wind and Densities Corrections (BALWND) program?

1. The sounding must contain at least five significant levels between the surface and the 700-hPa level
2. The sounding must contain upper wind data
3. The sounding must be within 100 nm of the forecast point
4. None

4-14. All EXCEPT which of the following parameters are user inputs to the Radiological Fallout (RADFO) model?

1. Weapon yield
2. Type of burst
3. Location
4. M-unit profile

4-15. The RADFO model is meant to be used only for which type of nuclear bursts?

1. High-altitude bursts
2. Deep-water bursts
3. Deep-underground bursts
4. surface or near-surface bursts

4-16. Which of the following statements is accurate with regard to the Forward-Looking Infrared (FLIR) program?

1. Weather changes throughout the forecast period are inputs to the program
2. Attenuation due to rain, fog, and haze are considered in the program
3. FLIR data may be interpolated for a layer above the maximum height of the sounding
4. Generally, the higher the wind speed, the shorter the ranges

4-17. At which of the following levels does the Aircraft Icing (AIRICE) program start its analysis?

1. The LFC
2. The LCL, or the surface if no LCL exists
3. The 1,000-hPa level
4. The CCL

4-18. Which of the following percentages are icing probability outputs from the AIRICE program?

1. 10, 20, 50, and 100% probabilities
2. 50 and 100% probabilities
3. 25, 50, 75, and 100% probabilities
4. Trace, 50, and 100% probabilities

4-19. Which of the following statements concerning the Tidal Prediction (TIDE) module is valid?

1. The TIDE module can be used for any coastal location
2. By inputting the current surface observation, surf conditions may also be calculated
3. A maximum of five stations may be retrieved at any one time
4. Tidal currents can not be predicted by using the TIDE module

4-20. What is the maximum number of leg segments that may be used with the trackline scenario of the Naval Search and Rescue (NAVSAR) program?

1. One
2. Five
3. Three
4. Four

4-21. Which of the following statements is NOT valid regarding the NAVSAR program?

1. The user can request up to five search object probability maps
2. The search altitude entry for a ship is the ship's bridge height or the height of the sensor
3. The user inputs all sweep widths
4. A maximum of eight weather observations may be entered

4-22. Which of the followinq statements is valid regarding the Raytrace (RAY) program?

1. The program uses several sound speed profiles simultaneously to generate a RAY diagram
2. The program traces only outgoing rays
3. The program calculates RAY diagrams for flat ocean bottoms only
4. Extrapolated data from sound speed profiles that do not extend to 2500 m is very accurate

4-23. Which of the following inputs is/are selectable for the Passive Acoustic Propagation Loss (PPL) program?

1. Mean water salinity
2. Mean water density
3. Target trackline data
4. Source and receiver depths

4-24. Which of the following statements is accurate regarding the Passive Acoustic Propagation Loss (PPL) program?

1. Convergence zone path cannot be inferred from the PPL output
2. The homogeneity of the watermass is not considered when using the program
3. Reliable output is constrained
4. PPL is a range dependent acoustic model

4-25. The QPL program uses both the LFBL data base and the COLOSSUS data base to estimate propagation loss.

1. True
2. False

4-26. Which of the following statements is accurate regarding the Near-Surface Ocean Thermal Structural (NOTS) program?

1. The program may be used in all oceanic areas
2. The program is used to forecast changes in the upper ocean temperatures
3. Output is available in a tabular output only
4. Output from the program is always unclassified

4-27. Which of the following information may NOT be inferred from a Sound Speed Profile (SSP) module output?

1. The existence of sound channels
2. The existence of convergence zones
3. The sonic layer depth
4. The presence of bottom bounce

4-28. Fleet Numerical Meteorology and Oceanography Center (FNMOC), Monterey, California, reviews all Bathy data prior to retransmission in a Bathy collective.

1. True
2. False

4-29. RP33 offers assistance in the ordering of MOE charts.

1. True
2. False

4-30. In order for a usable convergence zone path to exist, the water column must be deeper than the limiting depth by at least how many fathoms?

1. 50
2. 200
3. 300
4. 500

4-31. Which of the following factors has a major impact on bottom bounce transmission?

1. Composition of the bottom
2. Depth of the sound channel axis
3. Depth of the mixed layer
4. Strength of the thermocline gradient

4-32. Which of the following displays is an output from the Sonic Layer Depth (SLD) product?

1. A shaded SLD display expressed in meters
2. A shaded SLD display expressed in feet
3. A shaded SLD display expressed in kiloyards
4. A Regional Grid SLD display expressed in kiloyards

4-33. Which of the following statements regarding surface ducts is NOT valid?

1. Surface ducts may occur if the temperature within the mixed layer increases with depth
2. Surface ducts may occur if the temperature within the mixed layer decreases with depth
3. Surface ducts may occur if the temperature within the mixed layer remains isothermal
4. Generally, the deeper the mixed layer the more useful the surface duct

4-34. Which, if any, of the following statements pertaining to direct path propagation is valid?

1. Direct path is the simplest propagation path
2. Direct path ranges occur where there is slight to moderate reflection in the layer
3. The source and receiver must be within 90° of one another in order for direct path to be useful
4. None of the above

4-35. What influence does half-channel conditions have on the speed of sound in water?

1. Sound speeds increase to the top of the main thermocline, then decrease
2. Sound speeds decrease to the top of the main thermocline, then increase
3. Sound speed decreases with increasing depth
4. Sound speed increases with increasing depth

4-36. Where is the deep sound channel axis depth located?

1. At the depth of maximum sound speed in the deep sound channel
2. Always above the mixed layer depth
3. At the depth of minimum sound speed in the deep sound channel
4. Always within the main thermocline

4-37. What is another name for the deep sound channel?

1. The Optimum (OP) channel
2. The Sound Fixing and Ranging (SOFAR) channel
3. The Range/Bearing (RAB) channel
4. The Search and Rescue (SAR) channel

4-38. The relative strength of a shallow sound channel depends upon which of the following characteristics?

1. Surface turbidity
2. Surface turbidity and temperature
3. Stratum thickness
4. Density

4-39. Heavy shading on the Shallow Sound Channel Cutoff Frequency display indicates what limiting frequency range?

1. 1 to 50 Hz
2. 51 to 150 Hz
3. 151 to 300 Hz
4. 300 to 500 Hz

4-40. Which of the following noise sources is NOT referred to as ambient noise?

1. Noise due to earthquake activity
2. Noise due to precipitation
3. Self-noise
4. Fish/crustacean noise

4-41. What is the primary source of low frequency ambient noise?

1. Distant shipping traffic
2. Fish
3. Ocean fronts
4. Turbidity currents

4-42. At what sea height would waves first begin to affect active sonobuoy detection?

1. 12 ft
2. 9 ft
3. 6 ft
4. 3 ft

4-43. What is a good rule of thumb for sea state noises?

1. Sea state noise increases approximately 2 dB for each increase in sea state
2. Sea state noise increases approximately 3 dB for each increase in sea state
3. Sea state noise increases approximately 5 dB for each increase in sea state
4. Sea state noise increases approximately 6 dB for each increase in sea state

4-44. Which of the following statements pertaining to bioluminescent displays is accurate?

1. Most sheet-type bioluminescent displays are found in deep basins
2. Jellyfish may cause glowing-ball displays
3. Undulating waves of light are categorized as sheet bioluminescence
4. Spark-type bioluminescence primarily occurs in warmer waters

4-45. The Secchi Disc is used to obtain which of the following information?

1. A common measurement of water transparency
2. A common measurement of water color
3. A common measurement of incident illumination
4. A common measurement of reflectivity

4-46. Upwelling is normally found in the western portions of major oceans.

1. True
2. False

4-47. Which of the following statements is NOT characteristic of acoustic effects of fronts?

1. The sonic layer depth (SLD) can change by as much as 1,000 ft in crossing a front
2. Increased biological activity generally found along a front will increase ambient noise
3. Towed array accuracies will increase through the front
4. The depth of the deep sound channel may change by as much as 2,500 ft in crossing a front

4-48. Of the following systems, which is a principal mine hunting sonar system?

1. AN/SQQ-32
2. AN/SQQ-47
3. AN/SQR-19
4. AN/SQS-53

4-49. Sustained winds of 35 knots or greater define the minimum criteria for which of the following warnings?

1. Wind warnings
2. Storm warnings
3. Gale warnings
4. Small craft warnings

4-50. Of the following commands, which would issue tropical warnings for the western Pacific Ocean?

1. NAVPACMETOCCEN WEST GUAM
2. NAVPACMETOCCEN PEARL HARBOR
3. NAVPACMETOCFAC YOKOSUKA
4. NAVLANTMETOCCEN NORFOLK

4-51. Which of the following statements regarding the Atmospheric Refractivity Profile Generator (ARPGEN) product is NOT valid?

1. The refractivity data set can accommodate a maximum of five data sets
2. Levels above 10,000 m are discarded
3. Four types of historical profiles may be created
4. M-unit profiles are entered in ascending order

4-52. When using the M-unit profile entry of the ARPGEN program, the evaporative duct height is determined by using which of the following parameters?

1. Air temperature, sea level pressure, relative humidity, and wind speed only
2. Sea surface temperature, dewpoint, relative humidity, and air temperature only
3. Air temperature, relative humidity, wind speed, and sea surface temperature only
4. Air temperature and relative humidity only

4-53. Which of the following is an accurate statement with regard to altimeter settings?

1. The altimeter is set to the height of the cockpit
2. The altimeter is set to the station elevation
3. The altimeter is set to 10 ft above the deck
4. Naval aircraft have self-adjusting altimeters that do not need manual adjustment

4-54. Assume that an aircraft is flying at 9,000 ft. There is a 20-hPa pressure differential between the departure and arrival fields. Approximately how many feet of elevation change would this be?

1. 100 ft
2. 300 ft
3. 600 ft
4. 900 ft

4-55. Which of the following statements is generally valid of aircraft during flight?

1. In warmer ambient air, the altitude would be less than indicated
2. In warmer ambient air, the altitude would be greater than indicated
3. In colder ambient air, the altitude would be greater than indicated
4. Aircraft altimeters should never be adjusted while in flight

4-56. Which of the following statements is/are valid regarding environmental effects on electro-optical (EO) systems?

1. As wavelength decreases, resolution increases
2. As wavelength decreases, range decreases
3. Both 1 and 2
4. As wavelength decreases, range increases

4-57. Of the following statements, which one is accurate concerning “radiative crossover” and electro-optic contrast?

1. Unlike substances always have differing temperatures, enhancing contrast
2. Like substances heat and cool at different rates, enhancing contrast
3. All objects heat and cool at the same rate, inhibiting contrast
4. Different objects may have the same temperature at least twice daily, inhibiting contrast

4-58. En route weather (WEAX) and Aviation weather (AVWX) support are requested in movement reports (MOVREPS) in accordance with which of the following publications?

1. NWP-10-1-10
2. ATP-45
3. NTP-3
4. NWP-11

4-59. WEAX/AVWX support will be issued twice per day under which of the following weather conditions?

1. Wind speeds equal or exceed 25 knots, or are expected to equal or exceed 25 knots
2. Seas are 9 ft or greater, or expected to be 9 ft or greater
3. MINIMIZE is in effect
4. Seas equal or exceed 12 ft, or are expected to equal or exceed 12 ft

4-60. When aircraft are embarked, AVWX will increase to twice per day when which of the following situations occur?

1. Prevailing visibility is at or decreases to less than 6 nm
2. Prevailing visibility is at or decreases to less than 5 nm
3. The ceiling is at or decreases to less than 1,500 ft
4. The ceiling is at or decreases to less than 1,000 ft

4-61. Which of the following publications lists characteristics and capabilities of U. S. Navy ships?

1. NWP 65-0-1
2. NTP-3 SUPP 1
3. NTP-4
4. ATP-45

4-62. When ditching an aircraft becomes necessary, how should the landing take place when only one swell is present?

1. Landing should take place perpendicular to the swell, preferably on the top or backside of the swell
2. Landing should take place at a 45-degree angle to the swell, facing into the swell
3. Landing should take place parallel to the swell, preferably on the top or backside of the swell
4. No landing should be attempted when swell is present

4-63. Which of the following commands can provide assistance in planning specific climatology requirements?

1. NETPMSA, Pensacola
2. FLENUMMETOCDET, Asheville
3. NAVEURMETOCCEN, Rota
4. NAVICECEN, Suitland

ASSIGNMENT 5

Textbook Assignment: "Tropical Forecasting," "Weather Radar," "Meteorological and Oceanographic Briefs," and "Administration and Training." Pages 11-1 through 14-8.

5-1. Of the following statements, which one is valid regarding the development of tropical systems?

1. Trade inversions may accelerate development
2. Warmer, drier air may accelerate development
3. Twice as many tropical systems develop over the Atlantic Ocean as the Pacific Ocean
4. Cooler, drier air tends to hamper development

5-2. Which of the following weather patterns would be indicative of tropical cyclone development?

1. Easterlies increasing with height
2. Cyclonic turning in the wind field
3. Outflow at the lower levels
4. Decreasing surface pressure gradient to the north of the suspect area

5-3. Long period swell waves may be an indication of the development of a tropical system.

1. True
2. False

5-4. All EXCEPT which of the following weather patterns would be an indication of the deepening of a tropical system?

1. Movement over warmer water
2. The presence of a trade inversion
3. Poleward migration of the system
4. Deceleration of the system

5-5. Tropical cyclones that form along the eastern periphery of a polar trough tend to move in what direction?.

1. Toward the southeast
2. Toward the west
3. 90° to the left of the orientation of the trough line
4. Along the trough

5-6. Upper-level winds may be used for the steering of tropical systems. Which of the following wind patterns should be given the most consideration?

1. Those to the rear of the system
2. Those in advance of the system
3. Those in the left semicircle of the system
4. Those in the right semicircle of the system

5-7. Which of the following synoptic features would be an indicator of tropical cyclone recurvature?

1. The base of the polar westerlies lowers to 15,000 to 20,000 feet east of the storm's latitude
2. There are no breaks in the subtropical high
3. Long waves are stationary or slowly progressive
4. The neutral point in the southern extremity of the trough in the westerlies at the 500-hPa level lies poleward of the storm's latitude

5-8. Assume that the associated long wave is progressive, and the surface high slopes to the southeast with height. Which of the following weather patterns would be indicated relative to a tropical cyclone?

1. The tropical cyclone comes under the influence of the upper westerlies, and its track would reverse itself
2. The tropical cyclone comes under the influence of the upper easterlies, and its track would reverse itself
3. The tropical cyclone comes under the influence of the upper easterlies, and a large degree of recurvature would take place
4. The tropical cyclone comes under the influence of the upper westerlies, and a small degree of recurvature would take place

5-9. What weather pattern may develop when a tropical cyclone moves northward into an area with a strong temperature gradient?

1. The tropical cyclone center will maintain its circulation, and the area of gale force winds will decrease
2. The tropical cyclone center will lose its circulation, and the area of gale force winds will increase
3. The tropical cyclone center will lose its circulation, and the area of gale force winds will decrease
4. The tropical cyclone center will maintain its circulation, and the area of gale force winds will increase

5-10. If you use the regression equation method for forecasting the movement of typhoons, all EXCEPT which of the following criteria should be considered?

1. The 700-hPa heights and tendency 10° latitude from the typhoon's center, and 90° to the right of its path of motion
2. The 700-hPa level moisture
3. The 700-hPa heights and tendency 10° latitude north of the typhoon's center
4. The intensity and orientation of the axis of the subtropical anticyclone that is steering the system

5-11. Which of the following is the correct MANOP heading for tropical cyclone warnings in the Atlantic Ocean?

1. WHNT____KNCA
2. WHPN____KNGA
3. WHPN____KNGU
4. WHNT____KNGU

5-12. Which of the following is the correct WOP heading for tropical cyclone warnings in the western Pacific Ocean?

1. WTPN____PGTW
2. WTPN____PGUA
3. WTPN____PGUM
4. WTPA____PGTW

5-13. Which of the following wavelengths is considered optimum for use by weather radar in the detection of precipitation?

1. 1 to 5 cm
2. 5 to 10 cm
3. 15 to 20 cm
4. 20 to 25 cm

5-14. The ability to distinguish between two targets in the same direction from the radar, but at different ranges, is a definition of what term?

1. Range finding
2. Range differentation
3. Range resolution
4. Range attenuation

5-15. The advent of the WSR-88D occurred during the period 1977 through 1979 in the United States at what location?

1. The National oceanographic and Atmospheric Administration (NOAA) Environmental Research Laboratories, Washington D.C.
2. The University of Colorado at Boulder
3. The Naval Research Laboratory (NRL) San Diego
4. The National Severe Storms Laboratory in Oklahoma

5-16. Which of the following would be an example of velocity aliased data?

1. Velocities that can be measured without error
2. Velocities that exceed the maximum unambiguous velocity
3. Velocities equal to the Nyquist frequency
4. Wind speeds equal to the Nyquist frequency

5-17. A radar set hearing a previous pulse, while listening for the most recent pulse, would be a definition of what term?

1. Attenuation
2. Range-folding
3. Aliased data
4. Pulse repetition frequency (PRF) reversal

5-18. In the radials where it appears, range-folded data has what type appearance?

1. Baseball bat
2. Globular
3. Elliptical
4. Spiked

5-19. Which of the following statements is NOT accurate pertaining to ground clutter?

1. Ground clutter normally appears as a cluster of points that have a speckled nature
2. Ground clutter may be identifiable as wedges of different colors
3. Decreasing the antenna elevation will decrease ground clutter
4. A time-lapse of the Reflectivity products will show no movement of ground clutter returns

5-20. What is the maximum number of clutter suppression regions that may be edited at the Unit Control Position (UCP)?

1. 15
2. 12
3. 10
4. 5

5-21. The presence of sidelobes may have an impact on which of the following parameters?

1. The pulse repetition frequency (PRF)
2. The reflectivity of ground clutter
3. The velocity pattern in strong echo regions
4. The accurate assessment of storm cloud tops

5-22. Anomalous returns may occur near sunrise and sunset for several radials due to solar effects. What appearance may these solar effects take?

1. Numerous “speckled” areas
2. A narrow “baseball bat” shape
3. Numerous “spiked” areas
4. “Elliptically” shaped returns

5-23. The Mean Radial Velocity Cross-Section product may be used as an aid in identifying mesocyclone signatures.

1. True
2. False

5-24. The mesocyclone algorithm provides the position of the mesocyclone reflected onto the lowest elevation angle in which the mesocyclone was detected. What fact makes this possible?

1. Mesocyclones cannot be detected by doppler radar at mid and high levels of the atmosphere
2. The higher the elevation angle, the less accurate the tracking information
3. Mesocyclones can only be identified at low elevation angles
4. Mesocyclones normally “tilt” with increasing height

5-25. Which of the following procedures is best for identifying wind shear in the doppler velocity field?

1. Note changes in the velocity field over time
2. Increase the unit gain
3. Note wider bands in the velocity field
4. Note any elliptical shaped returns

5-26. The Cross-section product can integrate returns from cloud layers from the surface to what maximum height?

1. 30,000 ft
2. 50,000 ft
3. 70,000 ft
4. 90,000 ft

5-27. Stratus-type clouds may NOT be detected by the WSR-88D for which of the following reasons?

1. Transparency of the layer
2. Vertical extent of the layer
3. The size of the cloud particles
4. Stratus-type clouds generally form at levels below the lowest antenna angle

5-28. Frontal precipitation from stratiform clouds is occurring at your station. Which of the following statements would be valid when you observe the wind profile on the WSR-88D?

1. The wind profile may be useful in determining the nature of the front
2. Backing of the wind profile with height would indicate warm air advection
3. Veering of the wind profile with height would indicate cold air advection

5-29. The Mesoscale Convective System (MCS) includes all precipitation systems 11 to 270 nm wide that contain which of the following features?

1. Weak convection
2. Deep convection
3. Heavy fog
4. A center of action

5-30. The reflectivity of hydrometers is lower immediately below the bright band for which of the following reasons?

1. The decreased downward velocity of the hydrometers
2. The increased size of the hydrometers
3. The decreased concentration of the hydrometers
4. The increased concentration of the hydrometers

5-31. Which of the following Alert Thresholds is storm based only?

1. Grid
2. Volume
3. Area
4. Forecast

5-32. All EXCEPT which of the following statements regarding an operational radar coded message (RCM) is accurate?

1. It can only be requested from the display menu
2. It is an alphanumeric only product
3. It is also known as a “post-edit alphanumeric RCM”
4. It is available to all units

5-33. Graphics products may be annotated at all Principal User Processors (PUPS).

1. True
2. False

5-34. What is the maximum number of alert categories available to each alert area?

1. 10
2. 8
3. 6
4. 4

5-35. All EXCEPT which of the following status options is operator selected?

1. Monitor Performance Display
2. System Status
3. Status of Background Maps
4. Wavelength and Frequency Status

5-36. What are the two types of archive devices associated with a PUP?

1. Optical disk and CD-ROM
2. CD-ROM and streamer tape
3. Optical disk and streamer tape
4. Optical disk and 3.5 HD disk

5-37. OPNAVINST 3140.24 provides specific guidance and criteria applicable to which of the following subjects?

1. WEAX/AVWX forecasts
2. Climatology
3. Post-deployment reports
4. Destructive weather warnings

IN ANSWERING QUESTION 5-38, REFER TO TABLE 13-1 IN YOUR TRAMAN.

5-38. Assume that destructive winds are forecast to be at your station within 48 hours. What condition of readiness (COR) would be applicable?

1. Condition I
2. Condition II
3. Condition III
4. Condition IV

5-39. Which of the following publications outlines procedures for obtaining climatic information?

1. Atmospheric Climatic Publications; FLENUMMETOCDET ASHEVILLENOTE 3146
2. Atmospheric Climatic Publications; NAVEDTRA 43431
3. Atmospheric Climatic Publications; NAVMETOCCOMNOTE 3140
4. Atmospheric Climatic Publications; FLENUMMETOCCENNOTE 3143

5-40. The “Warnings Plot” program of GFMPL is capable of plotting which of the following messages?

1. High wind and seas warnings
2. Tropical cyclone warnings
3. Both 1 and 2 above
4. Ice edge positions

5-41. Which of the following statements is valid regarding the GFMPL "Surge" program?

1. It provides a "worst case" forecast
2. The program is available for the Pacific Ocean basin only
3. If a coastal station of interest is not one of the menu options, you may not input characteristics manually
4. The estimated peak storm surge output is a function of coastline characteristics only

5-42. The publication *Environmental Effects on Weapon's Systems and* Naval *Warfare,* (S) , RP1, contains information on ASW, SEW, ASUW, AAW, and STW warfare.

1. True
2. False

5-43. In what manner may an increase in water depth degrade bottom mine effectiveness?

1. By decreasing the actuation width of the mine
2. By increasing the actuation width of the mine
3. By increasing the damage width of the mine
4. By increasing mine burial upon impact

5-44. Subsurface current speed is important in MIW operations for which of the following reasons?

1. Decreased subsurface current speeds may result in scouring of mines
2. Decreased subsurface current speeds may result in mine dip
3. Decreased subsurface current speeds may increase ambient noise
4. "Mine walking" may occur

5-45. Which of the following statements regarding MIW is accurate?

1. Bottom scattering is dependent on grazing angle
2. Bottom sediment has no effect on MIW operations
3. The weight of a mine affects the "plastic flow"
4. Burial has significant impact on magnetic moored mines

5-46. Which of the following parameters is NOT a significant factor in MIW operations?

1. The clarity of the water
2. The salinity of the water
3. The depth of the water
4. Bioluminescence

5-47. The acronym "CATF" stands for what officer?

1. Commander, Allied Task Force
2. Commander, Amphibious Troop Force
3. Commander, Amphibious Task Force
4. Commander, Amphibious Flotilla

5-48. OA division personnel should test the adequacy of support and support timing during what phase of an amphibious operation?

1. The Planning phase
2. The Rehearsal phase
3. The Movement phase
4. The Assault phase

5-49. When does the assault phase of an AMW operation begin?

1. When troops first reach the beach
2. When amphibious vehicles debark the ships for the beach
3. When troops man amphibious vehicles
4. When the task force first reaches the amphibious objective area (AOA)

5-50. What is the single most important environmental parameter in amphibious assaults?

1. The deep water wave height
2. The swell wave period
3. The modified surf index
4. The littoral current

5-51. Which of the following statements is valid regarding offshore currents?

1. Tidal currents are not categorized as offshore currents
2. Offshore currents are found outside the surf zone
3. Offshore currents are generated by waves breaking over sandbars
4. Offshore currents include littoral currents

5-52. What annex standardizes meteorological and oceanographic information for the planning and execution of naval exercises?

1. ANNEX W to the numbered Fleet Basic OPORD
2. ANNEX H to the numbered Fleet Basic OPORD
3. The ANNEX identifier will vary, but the required information will always be found in the numbered Fleet Basic OPORD
4. ANNEX B to the numbered Fleet Basic OPORD

5-53. Guidance for the preparation and mailing of classified Meteorological and oceanographic (METOC) data is contained in what instruction?

1. NAVMETOCCOMINST 3100.2
2. OPNAVINST 1510.1
3. NAVMETOCCOMINST 5520.1
4. OPNAVINST 5510.1

5-54. Copies of all weather records are to be retained for a minimum of how many months?

1. 12
2. 24
3. 3
4. 6

5-55. A Unit Situation Report (SITREP) would be required in which of the following circumstances?

1. All accident/incident occurs within the vicinity of a METOC unit
2. A CASREP is sent from a shore-based METOC unit
3. An accident/incident occurs at a METOC unit, and is weather related
4. TMI accident/incident occurs aboard an underway unit and is not weather related

5-56. METOC commands with aviation units are required to annually conduct instrument ground school.

1. True
2. False

5-57. Commands should review and update forecaster handbooks at what interval?

1. Quarterly
2. Semiannually
3. Annually
4. Every 2 years

5-58. All EXCEPT which of the following statements is accurate regarding METOC post-deployment reports?

1. METOC post-deployment reports are always unclassified
2. NAVMETOCCOMINST 3140.23 outlines content and format of METOC post-deployment reports
3. METOC post-deployment reports should contain a section on any unique weather conditions experienced
4. METOC post-deployment reports should contain a section on services provided to other units

5-59. What directive outlines the responsibilities for the training of NAVMETOCCOM personnel?

1. NAVMETOCCOMINST 1515.1
2. NAVMETOCCOMINST 1500.2
3. NAVMETOCCOMINST 1510.4
4. NAVMETOCCOMINST 3100.4

5-60. The responsibility for technical inspection of afloat units lies with what authority?

1. COMNAVMETOCCOM
2. NAVOCEANO
3. The respective Fleet Commanders
4. The theater METOCCEN

"US Government Printing Office 1996. 733-130/40015

COURSE COMPLETION/DISENROLLMENT FORM
(Refer to instructions in front of course)

Date _____

PLEASE PRINT CLEARLY

AEROGRAPHER'S MATE 1 & C	82853
TRAMAN/NRTC TITLE	NRTC NAVEDTRA NUMBER
NAME, RANK, RATE, CIVILIAN	SSN

IF YOUR COURSE WAS ADMINISTERED BY NETPMSA, YOU MUST SUBMIT THIS FORM TO THE ADDRESS BELOW. IF YOUR COURSE WAS ADMINISTERED BY AN ACTIVE DUTY COMMAND OR NAVAL RESERVE CENTER, DO NOT SUBMIT THIS FORM TO NETPMSA.

CHECK ONE OF THE BELOW BOXES:

☐ COURSE COMPLETION

YOU SHOULD RETAIN THE TRAINING MANUAL AND THE ASSIGNMENT BOOKLET IF THEY ARE NOT CLASSIFIED. If CLASSIFIED, submit them to your command for proper disposition of CLASSIFIED material. A letter of satisfactory completion will be issued to you after your last assignment is received and processed. Include this form when you send in the last assignment. If the training manual and NRTC courses are designated with distribution statements B, C, D, E, F, or X, and you decide to dispose of the material, you must destroy the material to prevent disclosure of contents or reconstruction of the document.

☐ COURSE DISENROLLMENT

In the event of disenrollment, submit this form to the address below with any unused ADP answer sheets. You need not return any other course material. If the course material is CLASSIFIED, you must submit the material to your command for proper disposition of CLASSIFIED material. If the training manual and NRTC courses are designated with distribution statements B, C, D, E, F, or X, and you decide to dispose of the material, you must destroy the material to prevent disclosure of contents or reconstruction of the document.

PRIVACY ACT STATEMENT

Under authority of Title 5, USC 301, information regarding your military status is requested to assist in processing your comments and in preparing a reply. This information will not be divulged, without written authorization, to anyone other than those within DOD for official use in determining performance.

COMMANDING OFFICER
NETPMSA CODE 036
6490 SAUFLEY FIELD RD
PENSACOLA FL 32559-5000

NETPMSA 1550/31 (Rev. 3-95)

STUDENT COMMENT SHEET

THIS FORM MAY BE USED TO SUGGEST IMPROVEMENTS, REPORT COURSE ERRORS, OR TO REQUEST HELP IF YOU HAVE DIFFICULTY COMPLETING THE COURSE.

Date_____

FROM: _____ SSN _____

NAME (Last, first, M.I.)
RANK, RATE, CIVILIAN

Telephone Numbers:
DSN:_____
Commercial:_____
FAX:_____

_____

STREET ADDRESS, APT #

_____ ZIP CODE_____

CITY, STATE

To: COMMANDING OFFICER
NETPMSA CODE 0315
6490 SAUFLEY FIELD RD
PENSACOLA FL 32509-5237

Subj: AEROGRAPHER'S MATE 1 & C, NAVEDTRA 82853

1. The following comments are hereby submitted:

PRIVACY ACT STATEMENT

Under authority of Title 5, USC 301, information regarding your military status is requested to assist in processing your comments and in preparing a reply. This information will not be divulged, without written authorization, to anyone other than those within DOD for official use in determining performance.

. . . . . (Fold along dotted line and staple or tape. . . . . .

. . . . . (Fold along dotted line and staple or tape) . . . . . .

DEPARTMENT OF THE NAVY

COMMANDING OFFICER
NETPMSA CODE 0315
6490 SAUFLEY FIELD RD
PENSACOLA FL 32509-5237

OFFICIAL BUSINESS

COMMANDING OFFICER
NETPMSA CODE 0315
6490 SAUFLEY FIELD RD
PENSACOLA FL 32509-5237

NAVEDTRA 1430/5
Stock Ordering No. 0502-LP-216-0100

PRINT OR TYPE

TITLE_____ NAVEDTRA_____

NAME_____ ADDRESS_____
Last First Middle Street/Ship/Unit/Division, etc.

_____
City or FPO State Zip

RANK/RATE_____ SOC. SEC. NO._____ DESIGNATOR_____ ASSIGNMENT NO._____

☐ USN ☐ USNR ☐ ACTIVE ☐ INACTIVE OTHER (Specify)_____ DATE MAILED _____

SCORE

	1 T	2 F	3	4			1 T	2 F	3	4			1 T	2 F	3	4	
1	☐	☐	☐	☐	_____	26	☐	☐	☐	☐	_____	51	☐	☐	☐	☐	_____
2	☐	☐	☐	☐	_____	27	☐	☐	☐	☐	_____	52	☐	☐	☐	☐	_____
3	☐	☐	☐	☐	_____	28	☐	☐	☐	☐	_____	53	☐	☐	☐	☐	_____
4	☐	☐	☐	☐	_____	29	☐	☐	☐	☐	_____	54	☐	☐	☐	☐	_____
5	☐	☐	☐	☐	_____	30	☐	☐	☐	☐	_____	55	☐	☐	☐	☐	_____
6	☐	☐	☐	☐	_____	31	☐	☐	☐	☐	_____	56	☐	☐	☐	☐	_____
7	☐	☐	☐	☐	_____	32	☐	☐	☐	☐	_____	57	☐	☐	☐	☐	_____
8	☐	☐	☐	☐	_____	33	☐	☐	☐	☐	_____	58	☐	☐	☐	☐	_____
9	☐	☐	☐	☐	_____	34	☐	☐	☐	☐	_____	59	☐	☐	☐	☐	_____
10	☐	☐	☐	☐	_____	35	☐	☐	☐	☐	_____	60	☐	☐	☐	☐	_____
11	☐	☐	☐	☐	_____	36	☐	☐	☐	☐	_____	61	☐	☐	☐	☐	_____
12	☐	☐	☐	☐	_____	37	☐	☐	☐	☐	_____	62	☐	☐	☐	☐	_____
13	☐	☐	☐	☐	_____	38	☐	☐	☐	☐	_____	63	☐	☐	☐	☐	_____
14	☐	☐	☐	☐	_____	39	☐	☐	☐	☐	_____	64	☐	☐	☐	☐	_____
15	☐	☐	☐	☐	_____	40	☐	☐	☐	☐	_____	65	☐	☐	☐	☐	_____
16	☐	☐	☐	☐	_____	41	☐	☐	☐	☐	_____	66	☐	☐	☐	☐	_____
17	☐	☐	☐	☐	_____	42	☐	☐	☐	☐	_____	67	☐	☐	☐	☐	_____
18	☐	☐	☐	☐	_____	43	☐	☐	☐	☐	_____	68	☐	☐	☐	☐	_____
19	☐	☐	☐	☐	_____	44	☐	☐	☐	☐	_____	69	☐	☐	☐	☐	_____
20	☐	☐	☐	☐	_____	45	☐	☐	☐	☐	_____	70	☐	☐	☐	☐	_____
21	☐	☐	☐	☐	_____	46	☐	☐	☐	☐	_____	71	☐	☐	☐	☐	_____
22	☐	☐	☐	☐	_____	47	☐	☐	☐	☐	_____	72	☐	☐	☐	☐	_____
23	☐	☐	☐	☐	_____	48	☐	☐	☐	☐	_____	73	☐	☐	☐	☐	_____
24	☐	☐	☐	☐	_____	49	☐	☐	☐	☐	_____	74	☐	☐	☐	☐	_____
25	☐	☐	☐	☐	_____	50	☐	☐	☐	☐	_____	75	☐	☐	☐	☐	_____